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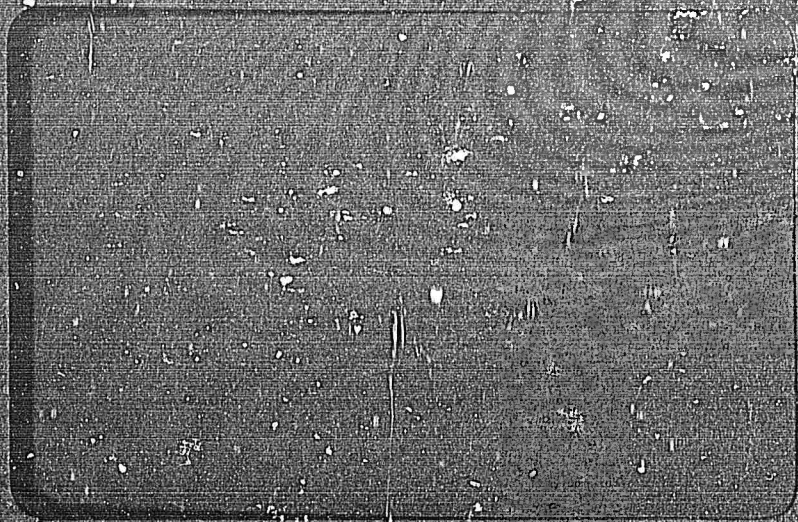
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CONVAIR ASTRONAUTICS  
CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

VALIDATION PROCEDURE FOR THE  
FLAME DEFLECTOR CONTROL SYSTEM  
(ELECTRICAL) "D" SERIES R & D  
SYCAMORE S-1  
AZN-27-044

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GROUP LAUNCHING CONTROLS DESIGN

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## SECTION I

### INTRODUCTION

This manual provides instructions for validating the Flame Deflector Control System (Electrical) "D" Series, R & D at Sycamore S-1. These instructions are applicable to the system as designed on the date of publication. Design changes may be required during, or after, system installation at the site. If changes are made which affect these instructions, this manual will also be revised.

The only permissible deviations to the procedures outlined in this document are those dictated by site installation difficulties. Such deviations shall be considered interim and must be forwarded to the Launching Controls Design Group for information and concurrence. Approved deviations will be automatically included in the next manual revision.

The test data sheet contained in this manual is a sample copy only and is not intended for actual test recording purposes. Separate copies of the test data sheet are furnished only to those departments whose activities require test data recording. These additional test data sheets are distributed under an identical cover sheet to the one on this manual except for the additional notation of "Test Data Sheet Only." Comparison of this special cover sheet with the one on the procedure correlates the two documents.

Personnel concerned with the use of this validation procedure can contribute to the effectiveness of any revisions by forwarding comments and suggestions to the Launching Controls Design Group, Building 4, Column G2, Montgomery Site, Convair-Astronautics.

### NOTICE

This document is intended for use as an acceptance validation procedure only. When this control system has been accepted (inspected, bought-off, sold, validated, etc.) no further requirement should exist for this document other than for reference purposes only. Continued checking of accepted systems occurs during the performance of Field Test Procedures, Countdowns, Composite System Checkouts, or Testing and Operating Procedures published by Groups having over-all system responsibility.

## SECTION II

### REQUIREMENTS

#### 2-1 REFERENCE DRAWINGS

- 27-69072 Diagram-Schematic, Flame Deflector, S-1, "D" Series.
- 27-69078 Panel Control Flame Deflector S-1, "D" Series.
- 27-69075 Diagram-Wiring, Control, Flame Deflector, S-1, "D" Series.
- 7-68231 Panel-Calibrating, Recording Meter.
- 27-69115 Diagram-Wiring, Console Assembly, Flame Deflector and Firex, "D" Series.

#### 2-2 EQUIPMENT REQUIREMENTS

Firex and Flame Deflector Console Assy.  
Missile Ground Rectifier (controlled by Missile Ground Power Control System)  
Auxiliary Pneumatic-Hydraulic Rack Assy with Power Supply PS-1.

#### 2-3 TEST EQUIPMENT

Multimeter  
Jumper Wire  
0-1000 ohm potentiometer with a duo-dial calibrated to represent 100 ohms per turn.

#### 2-4 OPERATING REQUIREMENTS

28 volts dc supplied by the Missile Ground Rectifier as normal blockhouse power.

#### NOTE

Where 28 volts dc is specified within this publication, the actual voltage output supplied by the Missile Ground Rectifier is intended. This voltage is adjustable and can vary between 26 and 29 volts. Voltage within this range is considered acceptable for system operation. An

OPERATIONOBSERVATION

- |  |  |
|--|--|
| 9.0 Connect an ohmmeter between terminals 30 and 33 of TB14. (Maintain this connection during the following step.)             | (a) Meter indicates circuit continuity.                          |
| 9.1 Throw the PUMP 2 switch to OFF. (Switch returns to CENTER position upon release.)  | (a) Meter indicates an open circuit while switch is actuated.    |
| 9.2 Connect an ohmmeter between terminals 31 and 32 of TB14. (Maintain this connection during the following step.)             | (a) Meter indicates an open circuit.                             |
| 9.3 Throw the PUMP 2 switch to UP position. (Switch returns to CENTER position upon release.)                                  | (a) Meter indicates circuit continuity while switch is actuated. |
| 9.4 Install a jumper between terminal 34 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.) | (a) PUMP 2 light comes on.<br>(Light goes off.)                  |
| 10.0 Connect an ohmmeter between terminals 35 and 38 of TB14. (Maintain this connection during the following step.)            | (a) Meter indicates circuit continuity.                          |
| 10.1 Throw the PUMP 1 switch to OFF. (Switch returns to CENTER position upon release.)   | (a) Meter indicates an open circuit while switch is actuated.    |
| 10.2 Connect an ohmmeter between terminals 36 and 37 of TB14. (Maintain this connection during the following step.)            | (a) Meter indicates an open circuit.                             |
| 10.3 Throw the PUMP 1 switch to UP position. (Switch returns to CENTER position upon release.)                                 | (a) Meter indicates circuit continuity while switch is actuated. |

OPERATIONOBSERVATION

- |      |  |   |
|------|--|---|
| 10.4 | Install a jumper between terminal 39 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)         | (a) PUMP 1 light comes on.<br>(Light goes off.) |
| 11.0 | Connect a d-c voltmeter across terminal 41 (+) of TB14 and negative (-) 28 volts dc. (Maintain this connection through step 11.2.) | (a) Meter indicates zero volts.                 |
| 11.1 | Throw the THROTTLE switch to OPEN.   | (a) Meter indicates 28 volts dc.                |
| 11.2 | Throw the THROTTLE switch to CLOSE.  | (a) Meter indicates zero volts.                 |

NOTE

The following steps validate the VERNIER PRESSURE meter.

- |      |  |   |
|------|--|---|
| 12.0 | Substitute the 0-1000 ohm potentiometer (adjusted to zero) at the test stand piping to simulate the Vernier Deflector Pressure transducer. |   |
| 12.1 | At the Auxiliary Rack containing Power Supply PS-1 throw the AC LINE switch to ON position.  |   |
| 12.2 | At the Pneumatic Control Panel throw the PANEL POWER switch to UP position.  |   |
| 12.3 | At the Auxiliary Rack containing Power Supply PS-1 throw the OUTPUT switch to ON position.   |   |
| 12.4 | Connect a d-c voltmeter across terminals 79 (+) and 80 (-) of TB14.  | (a) Meter indicates constant 28 volts dc. |



NOTE (Cont)

exception to this 26 to 29 volts is the constant 28 volts dc for the Calibrating Panel operating voltage which is supplied by the Instrumentation Power Supply PS-1 and controlled from the Pneumatic-Hydraulic Rack Assembly.

### SECTION III

#### VALIDATION PROCEDURE

#### 3-1 PURPOSE

This procedure determines that the electrical control equipment and circuitry of the Flame Deflector Control System is functioning correctly and properly connected.

#### NOTE

The Flame Deflector Control Panel meters listed below are not validated by this procedure.

THROTTLE POSITION meter  
MAIN PRESSURE meter  
MAIN FLOW meter

#### 3-2 PREPARATION

The following system preparations must be accomplished before validation begins.

1. Check that Flame Deflector Control Panel switches are in their center (off) positions except THROTTLE switch which is in the CLOSE position.
2. At the Facility Control Panel disconnect and tag the system control wires that originate from TB14 in the Firex and Flame Deflector Console for the pump control circuits. At the SDC Valve Control Relay Panel disconnect and tag system control wires that originate from TB14 for the Main Deflector, Vernier Deflector, and Throttle Control Valve circuits.
3. Check that all Flame Deflector Control Panel indicator lights are off.
4. Check that the power (120 VAC, 60 cycle), which is supplied to the system control valves through the control relays in the Secondary Distribution Center Relay panel, is disconnected or turned off.

5. Check that the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel is in the center (off) position, and that the F. S. ADJ (Full Scale Adjust) control is turned fully counter-clockwise.

### 2-3 PROCEDURE

The following two columns, OPERATION and OBSERVATION, show the actions to be performed and the results that should be observed during validation of the electrical control system.

#### NOTE

In the following steps of this procedure when switches are specified to be operated to an "UP," "CENTER," or "DOWN" position, these positions are capitalized for clarity only and do not necessarily reflect panel nomenclature.

In the following steps terminal points of TB14 are used as reference only for validation of valve control and pump control circuits. Actual connection of jumper wires and measuring devices is to be accomplished at the corresponding wire terminal location on the Facility Control Panel or Valve Relay Panel.

<u>OPERATION</u>	<u>OBSERVATION</u>
1.0 Connect a d-c voltmeter across terminals 4 (+) and 1 (-) of TB14.	(a) Meter indicates 28 volts dc.
2.0 Throw the PANEL POWER switch to UP position.	(a) PANEL POWER light comes on.
2.1 Check all press-to-test panel indicator lights.	(a) Each light comes on when pressed and goes off (except PANEL POWER light) when released.

<u>OPERATION</u>	<u>OBSERVATION</u>
2.2 Connect a d-c voltmeter across terminals 7 (+) and 1 (-) of TB14.	(a) Meter indicates 28 volts dc.
2.3 Connect a d-c voltmeter across terminals 8 (+) and 2 (-) of TB14.	(a) Meter indicates 28 volts dc.
2.4 Connect a d-c voltmeter across terminals 9 (+) and 3 (-) of TB14.	(a) Meter indicates 28 volts dc.
2.5 Connect a d-c voltmeter across terminal F1 (+) in the Secondary Distribution Center Valve Relay Panel and the nearest convenient negative (-) 28 volt dc terminal common to the blockhouse power supply source.	(a) Meter indicates 28 volts dc.
3.0 Connect a d-c voltmeter across terminal 10 (+) of TB14 and negative (-) 28 volts dc. (Maintain this connection during the following step.)	(a) Meter indicates zero volts.
3.1 Throw the VERNIER DEFLECTOR switch to UP position. (Return to CENTER position after observing indication.)	(a) Meter indicates 28 volts dc. (Meter indicates zero volts.)
3.2 Install a jumper between terminal 11 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)	(a) VERNIER DEFLECTOR light comes on. (Light goes off.)
4.0 Connect a d-c voltmeter across terminal 12 (+) of TB14 and negative (-) 28 volts dc. (Maintain this connection during the following step.)	(a) Meter indicates zero volts.
4.1 Throw the MAIN DEFLECTOR switch to UP position. (Return to CENTER position after observing indication.)	(a) Meter indicates 28 volts dc. (Meter indicates zero volts.)

<u>OPERATION</u>	<u>OBSERVATION</u>
4.2 Install a jumper between terminal 13 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)	(a) MAIN DEFLECTOR light comes on. (Light goes off.)
5.0 Connect a d-c voltmeter across terminal 14 (+) of TB14 and negative (-) 28 volts dc. (Maintain this connection through step 5.2.)	(a) Meter indicates zero volts.
5.1 Throw the SYSTEM READY switch to UP position.	(a) Meter indicates 28 volts dc. (b) SYSTEM READY light comes on.
5.2 Throw the SYSTEM READY switch to CENTER position.	(a) Meter indicates zero volts. (b) SYSTEM READY light goes off.
6.0 Connect an ohmmeter between terminals 15 and 18 of TB14. (Maintain this connection during the following step.)	(a) Meter indicates circuit continuity.
6.1 Throw the PUMP 5 switch to OFF. (Switch returns to CENTER position upon release.)	(a) Meter indicates an open circuit while switch is actuated.
6.2 Connect an ohmmeter between terminals 16 and 17 of TB14. (Maintain this connection during the following step.)	(a) Meter indicates an open circuit.
6.3 Throw the PUMP 5 switch to the UP position. (Switch returns to CENTER position upon release.)	(a) Meter indicates circuit continuity while switch is actuated.
6.4 Install a jumper between terminal 19 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)	(a) PUMP 5 light comes on. (Light goes off.)
7.0 Connect an ohmmeter between terminals 20 and 23 of TB14. (Maintain this connection during the following step.)	(a) Meter indicates circuit continuity.



<u>OPERATION</u>	<u>OBSERVATION</u>
7.1 Throw the PUMP 4 switch to OFF. (Switch returns to CENTER position upon release.)	(a) Meter indicates an open circuit while switch is actuated.
7.2 Connect an ohmmeter between terminals 21 and 22 of TB14, (Maintain this connection during the following step.)	(a) Meter indicates an open circuit.
7.3 Throw the PUMP 4 switch to UP position. (Switch returns to CENTER position upon release.)	(a) Meter indicates circuit continuity while switch is actuated.
7.4 Install a jumper between terminal 24 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)	(a) PUMP 4 light comes on. (Light goes off.)
8.0 Connect an ohmmeter between terminals 25 and 28 of TB14. (Maintain this connection during the following step.)	(a) Meter indicates circuit continuity.
8.1 Throw the PUMP 3 switch to OFF. (Switch returns to CENTER upon release.)	(a) Meter indicates an open circuit while switch is actuated.
8.2 Connect an ohmmeter between terminals 26 and 27 of TB14. (Maintain this connection during the following step.)	(a) Meter indicates an open circuit.
8.3 Throw the PUMP 3 switch to UP position. (Switch returns to CENTER position upon release.)	(a) Meter indicates circuit continuity while switch is actuated.
8.4 Install a jumper between terminal 29 of TB14 and positive (+) 28 volts dc. (Remove the jumper after observing indication.)	(a) PUMP 3 light comes on. (Light goes off.)

<u>OPERATION</u>	<u>OBSERVATION</u>
12.5 Throw the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel to RUN.	
12.6 Adjust the ZERO ADJ control of the Vernier Flame Deflector Calibrating Panel as required to obtain a zero indication on the VERNIER PRESSURE meter.	
12.7 Adjust the 0-1000 ohm potentiometer to 1000 ohms. The VERNIER PRESSURE meter indication increases as resistance is increased.	
12.8 Adjust the F.S. ADJ control of the Vernier Flame Deflector Calibrating Panel as required to obtain a full scale deflection on the VERNIER PRESSURE meter.	
12.9 Adjust the potentiometer to 500 ohms. The VERNIER PRESSURE meter should indicate approximately half scale after this adjustment.	
12.10 Throw the CALIB-RUN switch of the Vernier Flame Deflector Calibrating Panel to CALIB position.	
12.11 Adjust the CALIB STD. control of the Vernier Flame Deflector Calibrating Panel to obtain an indication of two major divisions less than full scale on the VERNIER PRESSURE meter. Lock the CALIB. STD. control after this adjustment.	

OPERATIONOBSERVATION

12.12 Return the CALIB-RUN switch to center (off) position, disconnect the 0-1000 ohm potentiometer, throw the OUTPUT switch and AC LINE switch on Power Supply PS-1 to their OFF positions, and throw the PANEL POWER switch on the Pneumatic Control Panel to CENTER position.

13.0 Disconnect the Console wiring at terminals 42, 43, 82, 83, 84, and 85 of TB14, and perform a continuity check of wiring between these terminals and their respective most remote termination points. (Reconnect the wires after observing indication.)

14.0 Perform a verification check of all wiring connections between the Control Console and the Facility Control Panel and system component terminations.

(a) Wiring is continuous between the console and remote termination points.

Satisfactory completion of the above procedure indicates that all of the electrical control system Flame Deflector Control Panel is valid, except for the meters listed in paragraph 3-1. The remaining meter validation procedures will be incorporated in this document by revision at a later date.

When no further testing is required, restore the system to its normal secured state.

## TEST DATA SHEET

Electrical System of \_\_\_\_\_ Version No. \_\_\_\_\_  
Top Drawing No. \_\_\_\_\_ Location \_\_\_\_\_  
Major Components Serial No.'s \_\_\_\_\_ Inspected By \_\_\_\_\_  
\_\_\_\_\_ Date Inspected \_\_\_\_\_  
\_\_\_\_\_ Inspection Approved By \_\_\_\_\_  
\_\_\_\_\_

Step No.	Validation Performed	Inspection Stamp
1.	D. C. Ground Power	AVAILABLE
2.	Panel Power Circuits	SATISFACTORY
3.	Vernier Deflector Valve Control Circuits	SATISFACTORY
4.	Main Deflector Valve Control Circuits	SATISFACTORY
5.	System Ready Circuit	SATISFACTORY
6.	Pump 5 Circuits	SATISFACTORY
7.	Pump 4 Circuits	SATISFACTORY
8.	Pump 3 Circuits	SATISFACTORY
9.	Pump 2 Circuits	SATISFACTORY
10.	Pump 1 Circuits	SATISFACTORY
11.	Main Deflector Throttle Control Circuits	SATISFACTORY
12.	Vernier Pressure Meter Circuits	SATISFACTORY
13.	Wiring Continuity Checks	SATISFACTORY
14.	System Wiring Connections	SATISFACTORY